Docket No.: 1309.43634X00

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re the Application of:

Kunihiko NASHIMOTO et al.

Serial No.    10/795,997

Filed:    March 10, 2004

For:    STORAGE CONTROL SUBSYSTEM FOR MANAGING LOGICAL
VOLUMES

### SUPPLEMENTAL PETITION TO MAKE SPECIAL
### UNDER 37 CFR §1.102(MPEP §708.02)

June 13, 2005

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Supplemental to the Petition to Make Special filed on June 6, 2005,

Applicants submit the following additional remarks.

It is submitted that the cited references, whether considered alone or in

combination, fail to disclose or suggest the invention as claimed. In particular,

the cited references, at a minimum, fail to disclose or suggest in combination with

the other limitations recited in the claims:

a first feature of the present invention as recited in independent claim 1

wherein a cache memory unit that temporarily stores data that is sent and

received to and from the channel control unit and the disk control unit, and online

information indicating whether a logical volume in the disk array is online; and

a second feature of the present invention as recited in independent claim 12 wherein control memory in which, for each of the plurality of logical volumes, volume discrimination information, ON/OFF information indicating whether an online state exists, and, in the event of an online state, path group information with regard to which host device(s) the subvolume is connected to, are recorded, and as a result of receiving a specific command from a certain host device, the channel control unit performs, before a target regular volume and target subvolume among the plurality of volumes are paired and data in the target regular volume is copied to the target subvolume, a first examination of whether the target subvolume is in an online state on the basis of the ON/OFF information on the target subvolume, and, when, as a result of this first examination, the target subvolume is known to be in an online state, the channel control unit performs a second examination with regard to which separate host device the target subvolume is connected to on the basis of path group information on the target subvolume.

To the extent applicable to the present Petition, Applicants submit that although the distinguishing feature(s) may represent a substantial portion of the claimed invention, the claimed invention including said feature(s) and their inter-operation provides a novel storage system and system and method related to or implemented in or by said storage system not taught or suggested by any of the references of record.

The references considered most closely related to the claimed invention are briefly discussed below:

**U.S. Patent No. 5,257,367 (Goodlander et al.)** discloses a disk drive access control apparatus for connection between a host computer and a plurality of disk drives to provide an asynchronously-operating storage system. A plurality of disk drive controller channels are connected to respective ones of the disk drives for controlling transfers of data to and from the disk drives. Each of the disk drive controller channels includes a cache/buffer memory and a micro-processor unit. An interface and driver unit interfaces with the host computer, and there is a central cache memory. Cache memory control logic controls transfers of data from the cache/buffer memory of the plurality of disk drive controller channels to the cache memory, and from the cache memory to the cache/buffer memory of the plurality of disk drive controller channels, and also from the cache memory to the host computer through the interface and driver unit. A central processing unit manages the use of the cache memory by requesting data transfers only of data not presently in the cache memory, and by sending high level commands to the disk drive controller channels. A first (data) bus interconnects the plurality of disk drive cache/buffer memories, the interface and driver unit, and the cache memory for the transfer of information. A second (information and commands) bus interconnects the same elements with the central processing unit for the transfer of control and information. (See, e.g., Abstract and column 5, line 40, through column 6, line 26.) However, unlike the present invention, Goodlander et al. does not disclose a cache memory unit that

temporarily stores data that is sent and received to and from the channel control unit and the disk control unit (claim 1), and/or online information indicating whether a logical volume in the disk array is online (claim 1), and/or control memory in which, for each of the plurality of logical volumes, volume discrimination information, ON/OFF information indicating whether an online state exists, and, in the event of an online state, path group information with regard to which host device(s) the subvolume is connected to, are recorded (claim 12), and/or a storage control subsystem wherein as a result of receiving a specific command from a certain host device, the channel control unit performs, before a target regular volume and target subvolume among the plurality of volumes are paired and data in the target regular volume is copied to the target subvolume, a first examination of whether the target subvolume is in an online state on the basis of the ON/OFF information on the target subvolume, and, when, as a result of this first examination, the target subvolume is known to be in an online state, the channel control unit performs a second examination with regard to which separate host device the target subvolume is connected to on the basis of path group information on the target subvolume (claim 12). More particularly, Goodlander et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 12, in combination with the other limitations recited in each of the independent claims.

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**U.S. Patent No. 5,388,243 (Glider et al.)** discloses a multi-port storage unit in a network architecture system, which can have any or all of its ports active at any time. There is provided a data processing system including one main processing unit, one mass storage unit, a plurality of controllers for controlling the one mass storage unit and interfacing between the one mass storage unit and the one main processing unit, and a data communications bus interconnecting the one main processing unit, the mass storage unit, and the plurality of controllers in a network configuration. The mass storage unit has a plurality of ports for communicating with the controllers, with two out of the plurality of ports being capable of being active at any one time, and one each of the two ports being connected to a different one of the plurality of controllers. Therefore, a plurality of the one main processing unit can communicate with the one mass storage unit via the network over a plurality of paths simultaneously, and each mass storage unit can communicate with the one main processing unit through the two paths. The system also includes a path state that indicates whether the storage unit is online, unavailable, or offline. (See, e.g., Abstract and column 3, lines 25 - 51, and column 7, lines 32 - 48.) However, unlike the present invention, Glider et al. does not disclose a cache memory unit that temporarily stores data that is sent and received to and from the channel control unit and the disk control unit (claim 1), and/or online information indicating whether a logical volume in the disk array is online (claim 1), and/or control memory in which, for each of the plurality of logical volumes, volume discrimination information, ON/OFF information indicating whether an online state exists, and, in the event

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of an online state, path group information with regard to which host device(s) the subvolume is connected to, are recorded (claim 12), and/or a storage control subsystem wherein as a result of receiving a specific command from a certain host device, the channel control unit performs, before a target regular volume and target subvolume among the plurality of volumes are paired and data in the target regular volume is copied to the target subvolume, a first examination of whether the target subvolume is in an online state on the basis of the ON/OFF information on the target subvolume, and, when, as a result of this first examination, the target subvolume is known to be in an online state, the channel control unit performs a second examination with regard to which separate host device the target subvolume is connected to on the basis of path group information on the target subvolume (claim 12). More particularly, Glider et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 12, in combination with the other limitations recited in each of the independent claims.

**U.S. Patent No. 6,854,034 (Kitamura et al.)** discloses a computer system that has a plurality of computers and a storage device subsystem connected to the plurality of computers. The storage device subsystem, which has a plurality of storage devices and a plurality of interfaces, is connected to the computers. One of the computers has a management means for holding data about the storage devices within the storage device subsystem and about a connection

relationship between the computers and storage device subsystem. Each

computer, when attempting to form a new device, informs the management

means of its capacity and type. The management means, when informed by the

computer, selects one of the storage devices satisfying its request. The

management means instructs the storage device subsystem to set necessary

data in such a manner that the requesting computer can access the selected

device. The management means also returns necessary data to the computer as

a device assignment demander, such that the computer as the requester can

modify its setting based on the data, and can use the assigned device. The

system also has an online or offline indication that indicates the state of the

logical devices, namely, whether or not they are allowed to be accessed by a

host computer. (See, e.g., Abstract and column 2, lines 1 - 47, and column 4,

line 61, through column 5, line 36.) However, unlike the present invention,

Kitamura et al. does not disclose a cache memory unit that temporarily stores

data that is sent and received to and from the channel control unit and the disk

control unit (claim 1), and/or online information indicating whether a logical

volume in the disk array is online (claim 1), and/or control memory in which, for

each of the plurality of logical volumes, volume discrimination information,

ON/OFF information indicating whether an online state exists, and, in the event

of an online state, path group information with regard to which host device(s) the

subvolume is connected to, are recorded (claim 12), and/or a storage control

subsystem wherein as a result of receiving a specific command from a certain

host device, the channel control unit performs, before a target regular volume

and target subvolume among the plurality of volumes are paired and data in the target regular volume is copied to the target subvolume, a first examination of whether the target subvolume is in an online state on the basis of the ON/OFF information on the target subvolume, and, when, as a result of this first examination, the target subvolume is known to be in an online state, the channel control unit performs a second examination with regard to which separate host device the target subvolume is connected to on the basis of path group information on the target subvolume (claim 12). More particularly, Kitamura et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 12, in combination with the other limitations recited in each of the independent claims.

**U.S. Patent Publication No. 2002/0184439 (Hino et al.)** discloses a method and system for providing a storage control unit to be connected to a fiber channel. A new storage control unit is added onto the fiber channel network during on-line operation and succeeds control information of a logical unit from the storage control unit which has been existing before, so as to be in charge of a process request issued to that logical unit from a host computer. A control memory able to memorize the control information is provided in each of the storage control units. The control information is necessary when succeeding or taking over the logical unit, and is represented by a construction information of a magnetic disk drive within a disk drive unit and construction information of the

logical unit. The contents of the control memory within the storage control unit are copied into the control memory of the storage control unit when the new storage control unit is added onto the fiber channel network. A memory capacity and a number of blocks store the total memory capacity and the total block number of that magnetic disk drive, and also a RAID group number stores the number of the RAID groups to which that magnetic disk belongs. Further, a condition stores an information for indicating whether that magnetic disk drive is in an on-line condition under which it can be used, or in a blocking condition under which it cannot be used. Furthermore, a kind of memory device is used for identifying the memory device on the fiber channel network, i.e., the magnetic disk device, the optical disk device, the magnetic tape device, or various kinds of library devices. (See, e.g., Abstract and paragraphs 33-34, and paragraph 70.) However, unlike the present invention, Hino et al. does not disclose a cache memory unit that temporarily stores data that is sent and received to and from the channel control unit and the disk control unit (claim 1), and/or online information indicating whether a logical volume in the disk array is online (claim 1), and/or control memory in which, for each of the plurality of logical volumes, volume discrimination information, ON/OFF information indicating whether an online state exists, and, in the event of an online state, path group information with regard to which host device(s) the subvolume is connected to, are recorded (claim 12), and/or a storage control subsystem wherein as a result of receiving a specific command from a certain host device, the channel control unit performs, before a target regular volume and target subvolume among the plurality of

volumes are paired and data in the target regular volume is copied to the target subvolume, a first examination of whether the target subvolume is in an online state on the basis of the ON/OFF information on the target subvolume, and, when, as a result of this first examination, the target subvolume is known to be in an online state, the channel control unit performs a second examination with regard to which separate host device the target subvolume is connected to on the basis of path group information on the target subvolume (claim 12). More particularly, Hino et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 12, in combination with the other limitations recited in each of the independent claims.

**U.S. Patent Publication No. 2003/0191917 (McBrearty et al.)** discloses a method and apparatus for synchronizing an offline mirror to a working copy. The method and apparatus include synchronizing an offline mirror to a working mirror while allowing access to data stored in the working mirror. A mirroring map is created that includes at least two working mirrors and an offline mirror. When the offline mirror is to be synchronized with one of the working mirrors, the two working mirrors are disassociated from each other, making each one an independent storage system. The offline mirror is then synchronized to one of the disassociated mirrors. The working mirror that is not being used to synchronize the offline mirror is used to provide access to stored data if needed.

After the offline mirror is synchronized, the two working mirrors are re-associated with each other. (See, e.g., Abstract and paragraph 15.) However, unlike the present invention, McBrearty et al. does not disclose a cache memory unit that temporarily stores data that is sent and received to and from the channel control unit and the disk control unit (claim 1), and/or online information indicating whether a logical volume in the disk array is online (claim 1), and/or control memory in which, for each of the plurality of logical volumes, volume discrimination information, ON/OFF information indicating whether an online state exists, and, in the event of an online state, path group information with regard to which host device(s) the subvolume is connected to, are recorded (claim 12), and/or a storage control subsystem wherein as a result of receiving a specific command from a certain host device, the channel control unit performs, before a target regular volume and target subvolume among the plurality of volumes are paired and data in the target regular volume is copied to the target subvolume, a first examination of whether the target subvolume is in an online state on the basis of the ON/OFF information on the target subvolume, and, when, as a result of this first examination, the target subvolume is known to be in an online state, the channel control unit performs a second examination with regard to which separate host device the target subvolume is connected to on the basis of path group information on the target subvolume (claim 12). More particularly, McBrearty et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in

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independent claim 12, in combination with the other limitations recited in each of the independent claims.

**U.S. Patent Publication No. 2003/0196056 (Vishlitzky et al.)** discloses a system and method for establishing a plurality of storage areas that include associating each of a first plurality of storage areas of a first type that contain sections of data with corresponding ones of a second plurality of storage areas of a second type having pointers to alternative sections of data storage areas of the first type. Initially, none of the second plurality of storage areas is available for accessing data. After associating all of the first and second plurality of storage areas, the second plurality of storage areas are activated to make the second plurality of storage areas available for accessing data. Exclusive access may be enabled for all of the first plurality of storage areas prior to activating the second plurality of storage areas, or to each storage area one at a time. The system also includes online/offline indicators that indicate whether a newly-established virtual device is online or offline. (See, e.g., Abstract and paragraphs 8 and 201.) However, unlike the present invention, Vishlitzky et al. does not disclose a cache memory unit that temporarily stores data that is sent and received to and from the channel control unit and the disk control unit (claim 1), and/or online information indicating whether a logical volume in the disk array is online (claim 1), and/or control memory in which, for each of the plurality of logical volumes, volume discrimination information, ON/OFF information indicating whether an online state exists, and, in the event of an online state, path group information

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with regard to which host device(s) the subvolume is connected to, are recorded (claim 12), and/or a storage control subsystem wherein as a result of receiving a specific command from a certain host device, the channel control unit performs, before a target regular volume and target subvolume among the plurality of volumes are paired and data in the target regular volume is copied to the target subvolume, a first examination of whether the target subvolume is in an online state on the basis of the ON/OFF information on the target subvolume, and, when, as a result of this first examination, the target subvolume is known to be in an online state, the channel control unit performs a second examination with regard to which separate host device the target subvolume is connected to on the basis of path group information on the target subvolume (claim 12). More particularly, Vishlitzky et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 12, in combination with the other limitations recited in each of the independent claims.

**U.S. Patent Publication No. 2004/0148479 (Patel et al.)** discloses a system and method for transferring data from a source storage unit, where storage units are configured within a storage system. A data transfer operation is processed to transfer data from source storage blocks in a source storage unit to corresponding target storage blocks in a target storage unit. For each source storage block, before transferring data from one source storage block to the

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corresponding target storage block, indication is made that the source storage block is in a locked state. Data in the source storage block in the locked state is not accessible to a host data request, and data in the storage blocks that are not in the locked state are accessible to a host data request while the data transfer operation is pending. Indication is further made that the source storage block is not in the locked state after transferring the data in the source storage block to the corresponding target storage block. (See, e.g., Abstract and paragraphs 8 - 12.) However, unlike the present invention, Patel et al. does not disclose a cache memory unit that temporarily stores data that is sent and received to and from the channel control unit and the disk control unit (claim 1), and/or online information indicating whether a logical volume in the disk array is online (claim 1), and/or control memory in which, for each of the plurality of logical volumes, volume discrimination information, ON/OFF information indicating whether an online state exists, and, in the event of an online state, path group information with regard to which host device(s) the subvolume is connected to, are recorded (claim 12), and/or a storage control subsystem wherein as a result of receiving a specific command from a certain host device, the channel control unit performs, before a target regular volume and target subvolume among the plurality of volumes are paired and data in the target regular volume is copied to the target subvolume, a first examination of whether the target subvolume is in an online state on the basis of the ON/OFF information on the target subvolume, and, when, as a result of this first examination, the target subvolume is known to be in an online state, the channel control unit performs a second examination with

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regard to which separate host device the target subvolume is connected to on the basis of path group information on the target subvolume (claim 12). More particularly, Patel et al. does not disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 12, in combination with the other limitations recited in each of the independent claims.

Therefore, since the cited references fail to disclose or suggest the above described first feature of the present invention as recited in independent claim 1 and the above described second feature of the present invention as recited in independent claim 12, in combination with the other limitations recited in each of the independent claims, it is submitted that all of the claims are patentable over the cited references whether said references are taken individually or in combination with each other.

In view of the foregoing, Applicant requests that this Petition to Make Special be granted and that the application undergo the accelerated examination procedure set forth in MPEP 708.02 VIII.

Respectfully submitted,

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